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Long-term Visual Outcome in Primary Microtropia

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Purpose: To study the long-term visual outcome of primary microtropia.

Methods: A retrospective review was made on 31 patients with primary microtropia with the follow-up period of 5 years or more (5–15 years, mean = 9.2 years) seen during 16 years from 1985 to 2000 at Okayama University Hospital. The patients were 16 boys and 15 girls, with the age at the initial visit ranging from 5 to 16 years (mean = 9.3 years).

Results: All patients showed anomalous retinal correspondence, peripheral fusion, 10 prism diopters or smaller esodeviation at the initial and final visit. At the initial visit, TNO stereoacuity was absent in 24 patients, 480 seconds in 3, and 240 seconds in 4. The visual acuity was 0.8 or better in both eyes of 16 patients, but 0.7 or worse in 1 eye or both eyes of 15 patients. At the final visit, the 24 patients with the absence of stereoacuity still showed its absence, while stereoacuity remained unchanged or improved in the 7 patients with initial stereoacuity of 480 seconds or better. In the 15 patients with 0.7 or worse visual acuity, it improved to 0.8 or better in 7 patients while it remained 0.7 or worse in the other 8 patients. Poor visual acuity had no relation to the absence of TNO stereoacuity at the initial and final visits.

Conclusion: Patients with primary microtropia could be largely classified into those with the absence of TNO stereoacuity throughout the course of treatment and those with some levels of stereoacuity that had a chance to improve during the follow-up. **Jpn J Ophthalmol 2003;47:507–511**

Key Words: Microtropia, primary microtropia, prognosis, stereoacuity, visual acuity.

Introduction

Microtropia is a clinical entity of comitant strabismus, characterized by a small angle of esodeviation, usually 10 or less prism diopters, in combination with anomalous retinal correspondence.[1–5] The degree of stereoacuity is often poor, but peripheral fusion is present. Microtropia is also called monofixation syndrome. The status of microtropia is sometimes observed as sequel to other types of strabismus.[6–8] Patients with infantile esotropia who have undergone surgical eye alignment often develop microtropia. Accommodative esotropia sometimes results in microtropia after a long-term follow-up. These types of microtropia are designated as secondary microtropia, in contrast with primary microtropia, which is present de novo. Genetic factors are likely to play a role in the development of primary microtropia, based on the presence of family history in patients with microtropia.[9]

The clinical manifestations of primary microtropia, such as anomalous retinal correspondence and poor stereoacuity, have long been believed to remain unchanged.[10] Recently, recovery in microtropia in terms of stereopsis and retinal correspondence has been described in some patients.[11–14] In this study, we analyzed whether clinical signs of primary microtropia really remained the same for a long period of follow-up.

Materials and Methods

This study included 31 patients (16 boys and 15 girls) with primary microtropia who had been followed for 5

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years or more during a 16-year period from January 1985 to December 2000 at the Strabismus Service in Okayama University Hospital. The age at the initial visit ranged from 5 to 16 years (mean = 9.3 years), and the follow-up period ranged from 5 to 15 years (mean = 9.2 years). The diagnostic criteria for primary microtropia were 10 prism diopters or smaller esodeviation in combination with anomalous retinal correspondence, suppression scotoma and peripheral fusion. Exclusion criteria were anisometropic or ametropic amblyopia, and secondary microtropia that followed surgical alignment for infantile esotropia or partially accommodative esotropia or resulted from a degenerative process of accommodative esotropia. Patients with normal retinal correspondence were not included in the study in order to differentiate microtropia from anisometropic or ametropic amblyopia.

Examination data at the initial and final visits were collected from medical charts of patients. These included best-corrected visual acuity, refractive errors obtained by atropine or cyclopentolate cycloplegia, deviations at 5 m and 0.3 m determined by alternate prism and cover test, stereopsis detected by TNO stereoacuity, anomalous retinal correspondence examined by afterimage test, suppression scotoma detected by four-prism diopter base-out prism test, and peripheral fusion by Bagolini striated glasses test.

During the follow-up period, the patients wore full-correction glasses, if necessary, after cycloplegic refraction with atropine or cyclopentolate, which was usually done once a year. Part-time occlusion was indicated when amblyopia was present. No other orthoptic training was done.

Results

Clinical features of the 31 patients with primary microtropia are summarized in Table 1. During the follow-up periods, all patients maintained anomalous retinal correspondence, peripheral fusion, and a small angle of esodeviation, all of which fitted the diagnostic criteria of microtropia. All patients showed central bifoveal fixation.

At the initial visit, TNO stereoacuity was absent in 24 patients, was 480 seconds in 3, and 240 seconds in 4. The best-corrected visual acuity was 0.8 or better in both eyes of 16 patients, while it was 0.7 or worse in 1 eye or both eyes of 15 patients. At the final visit, the 24 patients with the absence of TNO stereoacuity at the initial visit still showed its absence. Stereoacuity remained unchanged in 3 of the 7 patients with 480 seconds or better stereoacuity at the initial visit, and improved in the other 4 patients (Table 1). The 16 patients with best-corrected visual acuity of 0.8 or better in both eyes at the initial visit maintained the same level of visual acuity at the final visit. In 7 of the 15 patients with the initial visual acuity of 0.7 or worse in 1 eye or both eyes, the final visual acuity in both eyes became 0.8 or better. In contrast, the visual acuity of the other 8 patients with 0.7 or worse visual acuity in 1 eye or both eyes at the initial visit remained unchanged at the final visit.

The visual acuity at the initial visit or at the final visit had no relation with TNO stereoacuity (Table 2) at the initial or final visit, or with refractive error at the initial visit, the age at the initial visit, or the follow-up period.

Discussion

In this study, a large number of the patients with primary microtropia did not have measurable TNO stereoacuity throughout the follow-up period. Only 7 patients showed 480 seconds or better stereoacuity at the initial visit and maintained the same level of stereoacuity or gained better levels at the final visit. In contrast, the visual acuity in both eyes of about a half of the patients was 0.8 or better at the initial visit and also at the final visit.

Table 1. Follow-up Results of 31 Patients with Primary Microtropia*

Case No./Sex†	Age at Initial Visit (y)	Follow-up Period (y)	Best-corrected Visual Acuity‡		Refractive Error‡		APCT at 5 m (prism diopter)§§	TNO Stereoacuity (second)
			RE	LE	RE	LE		
1/M	13	6	0.4	1.5	+2.0	0	4	No
			0.8	1.5	+4.0	−1.0	2	No
2/F	5	11	0.9	0.9	+1.75	0	10	No
			1.5	1.5	−3.0	−3.0	8	No
3/M	6	7	0.6	0.5	0	0	6	No
			1.2	1.2	−3.5	−2.0	10	No
4/F	10	5	1.2	0.1	+1.0	+1.0	10	240
			1.5	1.5	+1.0	+1.0	10	240

(*Continued*)

Table 1. (*Continued*)

Case No./Sex[†]	Age at Initial Visit (y)	Follow-up Period (y)	Best-corrected Visual Acuity[‡]		Refractive Error[‡]		APCT at 5 m (prism diopter)[§§]	TNO Stereoacuity (second)
			RE	LE	RE	LE		
5/M	11	7	1.5	0.8	+1.5	+4.0	4	480
			1.5	1.2	+2.0	+3.75	0	120
6/M	11	7	1.5	0.5	0	+0.75	4	No
			1.2	0.5	−1.5	+0.5	4	No
7/F	11	8	1.5	1.2	+2.5	+2.5	10	No
			1.0	0.8	+1.5	+1.5	8	No
8/M	7	7	1.2	1.2	+1.0	+0.5	8	No
			1.2	1.2	+0.5	0	8	No
9/M	8	7	1.2	1.2	+0.75	+0.75	4	No
			1.2	1.2	0	0	8	No
10/M	8	6	2.0	0.1	0	+4.0	10	No
			1.5	0.2	−2.5	+3.0	6	No
11/M	7	5	1.0	0.5	+3.0	+4.0	4	No
			1.2	0.9	+2.0	+3.0	4	No
12/F	6	8	0.8	1.5	+6.0	+5.5	4	No
			0.8	1.5	+1.5	0	8	No
13/M	10	10	1.2	1.0	+6.0	+6.0	10	No
			1.2	1.0	0	+5.0	8	No
14/M	12	6	0.1	1.5	+4.0	0	6	No
			0.1	2.0	+2.0	0	6	No
15/F	7	10	1.2	0.3	+1.5	+5.0	4	No
			1.5	0.3	−1.75	+3.0	4	No
16/F	7	15	1.2	0.8	+4.0	+4.5	8	No
			2.0	0.9	0	+1.75	6	No
17/F	11	15	1.5	1.5	+0.5	+0.5	8	No
			1.5	1.2	0	0	6	No
18/M	8	6	0.2	1.5	+1.5	+1.5	10	No
			1.5	1.5	+1.0	+1.0	10	No
19/F	8	8	1.5	1.2	+4.0	+2.0	6	No
			1.0	1.5	−2.0	+0.5	4	No
20/F	5	6	0.4	1.0	+6.0	+6.0	10	No
			1.2	1.0	+1.5	+2.0	10	No
21/F	10	15	1.2	1.0	+4.0	+5.0	4	No
			1.5	1.0	+1.0	+3.5	8	No
22/M	16	7	1.5	0.9	0	+2.0	10	No
			1.5	1.0	0	+2.0	6	No
23/M	10	9	1.5	0.7	0	+5.5	6	No
			1.5	0.7	0	+3.0	4	No
24/F	7	15	0.8	1.5	+0.5	+0.5	10	No
			1.0	1.2	−0.5	−2.5	8	No
25/M	6	15	0.7	0.5	+6.5	+6.5	8	No
			1.2	0.8	+3.0	+3.0	6	No
26/F	13	9	1.2	1.0	+2.5	+3.5	6	480
			1.2	1.5	+2.0	+2.0	6	60
27/F	11	13	1.0	0.9	+1.75	+1.0	10	240
			1.0	1.0	+2.0	+1.25	8	240
28/F	15	10	1.2	0.5	+1.0	+6.5	6	240
			1.5	0.6	0	+3.75	2	120
29/F	10	13	1.0	0.9	+3.75	+4.25	8	240
			1.5	1.0	+0.5	+2.5	6	15
30/M	7	10	1.5	0.1	0	+2.0	10	No
			1.5	0.1	0	+4.5	8	No
31/M	12	10	1.2	0.5	+1.5	+5.0	8	480
			1.5	0.4	0	+5.0	8	480

*In each column, upper line shows initial visit data and lower line shows final visit data.
[†]M: male, F: female.
[‡]Refractive errors are given in spherical equivalents. RE: right eye, LE: left eye.
[§]APCT: alternate prism and cover test.

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Table 2. Relation Between TNO Stereoacuity and Best-corrected Visual Acuity at the Initial and Final Visit in 31 Patients with Primary Microtropia

	TNO Stereoacuity	
Best-corrected Visual Acuity	Absent	480 seconds or better
At initial visit		
0.7 or worse	12	3
0.8 or better	12	4
At final visit		
0.7 or worse	6	2
0.8 or better	18	5

No relation between visual acuity and stereoacuity at the initial visit or at the final visit. ($p > .9999$, Fisher exact probability test).

The remaining half showed 0.7 or worse visual acuity in one eye or both eyes at the initial visit, and had about a 50% chance to gain 0.8 or better visual acuity in both eyes at the final visit. Based on these facts, amblyopia in primary microtropia is treatable to some extent with full-correction glasses and part-time occlusion as reported previously,[15–17] but basically poor levels of stereoacuity could not be changed. Furthermore, poor visual acuity had no relation with the absence of TNO stereoacuity, suggesting the dissociation between visual acuity and stereoacuity. Such dissociation could be explained by different localization in the visual cortical areas for visual acuity and stereopsis.

Based on this study, patients with primary microtropia could be roughly classified into those with the absence of TNO stereoacuity throughout the course of treatment and those with some levels of stereoacuity that had a chance to improve during the follow-up. The patients with the absence of TNO stereoacuity throughout the course of treatment might have more severe levels of anomalous retinal correspondence, in contrast to the patients with measurable levels of stereoacuity who might have milder levels of anomalous retinal correspondence. Primary microtropia would have, therefore, a spectrum of the disease ranging from a subnormal form to a definitely abnormal form. A boundary between the subnormal and the normal might be arbitrary at the moment and could be changeable based on the definition of microtropia and methods of binocular vision testing. Different views exist as to whether anomalous retinal correspondence should be included in the diagnostic criteria and by what method of testing such anomalous retinal correspondence is determined.

Our results are in marked contrast with previous studies from Glasgow that about a third of patients with primary microtropia could gain 60 seconds or better stereoacuity[11] and that anomalous retinal correspondence in some patients became normal retinal correspondence in the follow-up.[12] These conflicting results between our study and their studies might be attributed to different methods of binocular vision testing. Stereoacuity was determined by the TNO stereotest in our study but by Frisby, Titmus, or Lang II test in their studies.[11] Anomalous retinal correspondence was detected by afterimage test in our study, but by Bagolini striated glasses test in their studies.[11] In our study, the presence of anomalous retinal correspondence on afterimage test was required as inclusion criteria for microtropia, and patients with normal retinal correspondence on afterimage test were excluded from the study to differentiate microtropia strictly from anisometropic or ametropic amblyopia. These strict inclusion criteria for microtropia might result in the inclusion of only the patients with severe levels of anomalous retinal correspondence and might explain the poor outcome of stereoacuity in this group of patients analyzed in the present study. Further studies are necessary to answer the question of whether primary microtropia is a static or changeable phenomenon.

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